Title

AITI Report
87-005

UCRL 21058
PO 1194803

Boeing Military Airplane Company Technical Order Transfer Tests

June 12, 1987

Prepared for
Lawrence Livermore
National Laboratory
Air Force Logistics Command
AITI Project

Lawrence Livermore National Laboratory

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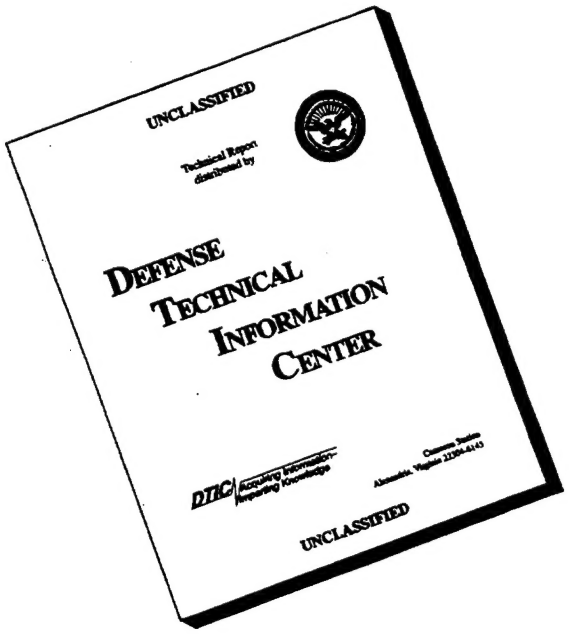

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Test	File Set	Document
SYSCON 87-06	BMAC 87-01	AITI-Ref-1986-1

Lawrence Livermore National Laboratory

Contents

1 Executive Summary

The AFLC/AITI Standards Project is testing the Military Standard for the Automated Interchange of Technical Information, MIL-STD-1840 (the Standard). The objective of the tests is to demonstrate the validity of the transfer protocol defined in the Standard itself and the viability of standardized formats for the transfer of technical information defined in other specifications used by the Standard.

One document (file set) was prepared by Boeing Military Airplane Company (BMAC) for this test. The document was prepared in accordance with Appendix A of the December 12, 1986, draft revision of the Standard. The file set, on magnetic tape, was delivered to the ATOS laboratory facility at SYSCON Corporation, San Diego, California, for testing. The file set consisted of a declaration file, SGML tagged text files, and IGES illustration files written on magnetic tape in accordance with FIPS PUB 79 and the Standard.

The tape format was in complete accordance with FIPS PUB 79. This critical point in the transfer process was successful. Almost any failure here would mean complete failure of the transmission. The declaration file was also completely acceptable.

The text files were generally successful in meeting the requirements of the USAF SGML tagging scheme. The quality could be characterized as very good for a first effort but not quite good enough for a production environment. After a few minor corrections, a reasonable reproduction of the original could be generated. Inexperience and lack of automated quality control (AQC) tools account for the errors.

The illustrations transmitted in IGES format matched the original published illustrations very well except for the type fonts in the text callouts. Font problems with IGES have been noted since the beginning of the test program. In general, this part of the test was a success with the exception noted.

The goal of the test was met, even with the deficiencies noted. Based on the results of this test and prior observation, it is recommended that:

1. Sending systems be provided with AQC tools and improved reference documentation to assist preparers of SGML text files.

2. IGES be improved with respect to text fonts, including alphabet size and set width specifications and style and emphasis parameters.

Boeing Military Airplane Company Transfer Tests-Summary of Compliance to MIL-STD-1840 (12 December 1986)

Major Compliance Categories	File Set 1	Comments
Transmission Envelope		
ANSI Level 3 tape	pass	
MIL-STD-1840 tape	pass	
Declaration file	pass	
Header records	part	
SGML		
Correct use	part	
No minor errors	fail	
No tag typo's	pass	
IGES		
Version 3.0	fail	
Parser/Verify	part	
Subset compliance	pass	Accidental compliance
All good images	pass	
CCITT		
All good images	-	

pass = compliant in all respects
part = partial compliance, usable data
fail = noncompliant, unusable data
- = no graphic data in this form
* = ureadable tape

Explanation of Table of Summary of Compliance to MIL-STD-1840 (12 December 1986).

Major Compliance Categories	Explanation of Category
Transmission Envelope	**The "wrapper" around the documents**
ANSI Level 3 tape	The tape complies with FIPS PUB 79
MIL-STD-1840 tape	The tape complies with specific MIL-STD-1840 req'ments
Declaration file	The Document Declaration files are correct
Header records	The Header records for each data file are correct
SGML	**SGML tagged text files**
Correct use	The source system personnel understand SGML broadly
Required tags present	All required tags are present
Tags keyed correctly	All tags are keyed correctly
IGES	**Illustrations in IGES format**
V 3.0	The files are in conformance with Version 3.0
Parser/Verify	The file passes the parser/verifier without serious error
Subset compliance	The files comply with MIL-STD-1840 IGES subset req'ments
All good images	The IGES postprocessor produced an accurate image
CCITT	**Illustrations in CCITT Raster format**
All good images	Usable images can be derived from the data

pass = compliant in all respects
part = partial compliance, usable data
fail = noncompliant, unusable data
- = no graphic data in this form
* = unreadable tape

2 File Set Preparation and Processing

The transmission tape was written at BMAC, Wichita, on a VAX. The IGES illustrations were generated on an Auto-trol system and transferred by tape to the VAX.

One document was prepared by BMAC for this test. The document was the AITI Reference T.O. 86-1. The document was prepared in accordance with Appendix A of the December 12, 1986, version of the Standard.

The file set, on magnetic tape, was delivered to the ATOS laboratory facility at SYSCON Corporation, San Diego, California, for testing. The initial tape processing and the majority of the testing was performed on a VAX. An Auto-trol AGW 70 was used to convert the IGES files to a CAD format and subsequently to a plotter format. The plotter files were then converted to a form acceptable to the QMS laser printer. Text hardcopy was output on the same printer.

Appended to the body of the report are paired exhibits of pages from both documents in their as-published form and in the as-transmitted and processed form.

The file set was processed in the ATOS laboratory with a combination of specially built and commercially available software. The file set consisted of a declaration file, SGML tagged text files, and IGES illustration files written on magnetic tape in accordance with FIPS PUB 79 and the protocol specified in the Standard.

3 Test Results

The test results for the transmission envelope are presented first. Following that, the results for the document are presented for the SGML text files and the IGES illustration files.

Problem Numbering

In order to avoid repetitious statement of recurring problems encountered during the preceding year of testing, certain problems will be identified by numbering them according to the standard involved and the order of occurrence: for example, IGES-1 or SGML-3. When the same problem is encountered in a submission from a different sending system, it will be referred to by that number. These numbered problems will include only difficulties or deficiencies inherent in the Standard or the specifications on which the Standard calls. Problems attributable to preparation by the sending system or by vendor-supplied hardware/software will be identified separately and specifically.

Transmission Envelope

Analysis

The document transmission envelope consists of the tape and file labels (found "in" the magnetic tape), the document declaration files, and the header records for the text and illustration files.

The envelope created by BMAC was correct in all respects but one. The flaw was present in the fourth record in each illustration file. The Standard specifies that the fourth header record preceding an IGES file shall contain the value of the location attribute found in the "<figure" tag followed by a colon, which, in turn, is followed by the value of the ID attribute of the same tag instance. The content as found appeared to contain some sort of identifier assigned with sequentially increasing values for each illustration. The lack of the colon as punctuation prevented parsing the record into two values which could be compared with the attribute values of the "<figure" tags. The flaw should be classed as minor to medium in severity. The flaw did not prevent reading the files from the tape and testing the files to completion.

Statistics

The transmission contained one document. The document contained two text files and seven IGES files. Table 1 below summarizes the statistics on file sizes.

Table 1.
File Size Statistics
(in bytes)

AITI-Ref-1986-1	
Declaration File	231
Text Files	
T001S0001.	2,951
T001S0002.	42,309
Total	**45,260**
IGES Files	
F001Q0001.	106,240
F001Q0002.	47,520
F001Q0003.	188,480
F001Q0004.	99,840
F001Q0005.	88,200
F001Q0006.	57,360
F001Q0007.	77,120
Total	**664,760**
Grand Total	**710,251**

Text Files

AITI-Ref-1986-1 Analysis

The text of the document was transmitted in two files. The portions of the first file containing the list of effective pages (LEP) and the Table of Contents (TOC) were not composed on ATOS. ATOS automatically generates these elements of the document. The LEP and TOC files were, however, subjected to all other phases of the testing.

The printed original document (AITI RefT.O. 86-1) was produced in the ATOS laboratory at SYSCON, San Diego, using SGML tags. In general terms, the purpose of this part of the validation test is to determine if a given application of SGML can adequately support the goals of the CALS policy as implemented by MIL-STD-1840. In a more specific sense, the purpose of this test was to discover if a printed document of known
tagging characteristics (at the destination system) could be closely approximated in appearance and structure by the tags used by the sending system. This is intended as a test of the capability of a given application of SGML, not as a test of the expertise of the SGML coders at the sending system. The reader is asked to keep the distinction in mind since it is inevitable that the two issues become intertwined when test results are reported.

The quality of the tagging by the sending system was excellent, considering that it was a first effort. Three tagging errors were discovered that could have been caught by a quality control software tool. All were minor, having to do with the "<page...>" tag required by the Standard. None of the errors impeded composition of the text. A comment line was inserted in the text file noting what repair had been made. In the listing of the file "BMAC11.txt", these comment lines begin with the string "[co." This string, and any characters following it on the same line, is accepted by the ATOS text composition software as a comment and is not processed into the final output. Most of the comments related to artifacts of the testing environment and not to tagging errors.

Several other tagging errors found would not have been caught by a QC software tool. They are listed below. Not listed as discrepancies are the change version of the pages in the LEP and the lack of change bars. The BMAC text files were coded with "change bar" tags. The ATOS job setup to compose the text treated the input files as a "no change" document, thus the lack of change bars, etc.

1. The distribution notice on the cover page differs in placement from the original. The original used a <notice type=b> tag, whereas the BMAC submission used the simple <notice> tag. Refer to Exhibits 1 and 2.

2. Page 2-1. Paragraph 2-2 in the original was miscoded as a <p1> instead of a <p0>, causing it to be numbered "d." in the BMAC submission. Refer to Exhibits 3 and 4. The overflow of text to a

second page is a test artifact and not significant.

3. Page 3-5. The backslash following the subparagraph titles is caused by a coding error. The DTD does not permit paragraph titles (terminated with a backslash) at the <p2> level. This error is found in several other places in the document. See Exhibits 5 and 6.

4. Page 4-1. The descriptions of RECORD 5 and RECORD 9 use the string "??" rather than the string "<=". BMAC coders apparently could not determine how to enter the "<=" group from reading the reference material supplied to them. Refer to Exhibits 7 and 8.

5. Page 4-2. The word "representation" was omitted from the last line of paragraph (4) 4. This caused a shift of text allocation, pulling text from the next page. No exhibit.

6. Page 5-1. The BMAC version of this page shows that "<para>" tags were omitted. The tags should have been placed in front of the phrases "Figure 5-3..." and "Figure 5-4..." Refer to exhibits 9 and 10.

Some conclusions may be drawn by analyzing the detail represented by the preceding representative comments.

In this test environment, inexperience with the SGML application may be taken as a "given" and is, therefore, not significant.

The absence of simple AQC tools is significant. All of the coding errors detected by the laboratory preprocessing software and the text composition software at the destination system could have been detected by an AQC tool at the sending system and, therefore, corrected. The other errors noted above cannot be detected by simple AQC tools.

These errors can be attributed to many causes, some of which are:

a. Inadequate reference documentation used by "taggers."

b. Inadequacies of the SGML application itself.

c. Idiosyncrasies in the SGML implementation software.

There were a number of errors reported by the ATOS spellchecker. In the listing of spelling errors, where duplicates are deleted, 13 of the 25 words listed are acronyms or names for programs or files. These 13 words constituted 42 of 54 (78%) of the entries in the list before duplicates were deleted.

Two groups of words are shown below. The first group contains acronyms, and abbreviations that would not ordinarily be found in a spelling dictionary. The second group contains possible English words that are either unknown to the dictionary, technical neologisms, or misspelled.

ATOS, AnaTech, Auto-Trol, DL, DLEDT, FINALPASS, FNVAL, GenCode, GenCoded, IGEDPARS, PLOTUPF, RLE, RVBIT, SCANTAPE, TESTBED, VDRIVE, xyz

Nongovernment, Tech, asks, occassional, ot, phototypsetter, plotfile, praticality, validator

Of the nine words in the second group, one word is legitimate (asks), two words are technical neologisms (plotfile, validator), and the remainder are misspelled. When a spellchecker is used as a receiving inspection QA tool, it is extremely helpful if the source system has supplied a spelling exception list. In that case the 17 words in the first group would not distract the person performing the receiving inspection from the 8 unacceptable words.

There are three problems bundled together in this one list: false errors due to unrecognized acronyms and other special words, false errors due to rejecting legitimate words, and true errors in spelling. The latter again points up the need to supply AQC tools (or validate the sending system tools).

The foregoing discussion would seem to lend some support for restoring the Special Words file (exception list addendum for spellcheck software) to MIL-STD-1840A.

AITI-Ref-1986-1 Statistics

Table 2 below shows the file size in bytes and the number of tags in the two text files. The statistics do not include the "[co" comment lines used to record fixes to the text files.

Table 2.
Text File Sizes - DOC001.

File Name	Bytes	Tags
T001S0001.	2,951	200
T001S0002.	42,309	426
Totals	**45,260**	**626**

IGES Files

AITI-Ref-1986-1 Analysis

The most significant finding is that the images transferred with near perfect accuracy. The less than perfect aspect had to do primarily with font definitions. Refer to Exhibits 3 and 4, and 11 and 12.

IGES-1 - IGES (Version 3.0) does not have the capability to identify fonts that will match the area defined for the note (entity 212). This deficiency presents a serious problem for those contemplating the use of MIL-STD-1840. Text in illustrations must be manipulated at the destination system to fit the apparent intended note area, but the amount of manual intervention required to achieve this "cut and try" solution makes a mockery of the "A" in AITI. A proposed solution has been described in AITI Report 87-002.

Vendor-Related Problems

It is clear from examination of the log file output from the IGES Data Analysis (IDA) Parser/Verify software that there are several points on which IDA and Auto-trol disagree in regard to interpretation of the IGES requirements. Both parties have been supplied with copies of the log files along with a request to "do something." No further action from this end is planned at this time. If there are true deficiencies in the Auto-trol IGES preprocessor output, they will not be found by submitting the file to an Auto-trol IGES postprocessor.

AITI-Ref-1986-1 Statistics

The statistics tabulated below were compiled from the output generated by the IGES Data Analysis Parser/Verify software. The complete listings follow the text of this section.

Table 3 presents data on the number of records in the file for each illustration. The seven illustrations in this document required 8,212 records and about 650,000 bytes for transmission in IGES uncompressed ASCII format.

Table 3.
Count of Records per Section In Data File

Doc	File	Section S	G	D	P	T	Total	Avg. Byte
1	1	1	3	858	460	1	1323	246
1	2	1	3	382	202	1	589	246
1	3	1	3	1312	1034	1	2351	286
1	4	1	3	776	462	1	1243	256
1	5	1	3	656	374	1	1035	252
1	6	1	3	450	257	1	712	253
1	7	1	3	610	344	1	959	251
TOTAL		**7**	**21**	**5044**	**3133**	**7**	**8212**	**256**

8,212 records of 80 bytes = 664,760

Table 4 presents data on the count of entity types and forms of entities within type, shown by the level to which the entity and form combination was assigned.

Table 4.
Entity Occurrence Counts

Ent	Form	Lvl	File Number 0001	0002	0003	0004	0005	0006	0007	Total
100		1	0	0	0	2	0	0	0	2
100		2	0	0	20	38	8	11	16	93
104	0	2	0	0	0	0	0	0	1	1
106	11	2	11	0	3	0	7	4	1	26
106	11	5	0	0	0	13	0	0	0	13
106	11	15	0	0	163	0	0	0	0	163
106	12	15	0	0	5	0	0	0	0	5
110		1	0	175	191	32	13	26	73	510
110		2	262	5	51	48	47	38	61	512
110		3	0	0	0	177	0	0	0	177
110		4	0	0	0	44	96	0	0	140
110		5	0	0	10	0	0	112	120	242
110		8	136	0	0	0	0	0	0	136
110		15	0	0	164	0	125	0	0	289
124	0	2	0	0	0	0	0	0	1	1
124	0	4	0	0	0	4	0	0	0	4
212	1	4	20	11	48	30	31	33	31	204
212	1	100	0	0	1	0	1	1	1	4
Total			**429**	**191**	**656**	**388**	**328**	**225**	**305**	**2522**

Table 5 shows the entity count by level for each of the illustrations.

It would be beneficial to users of MIL-STD-1840 to encourage IGES pre- and postprocessor vendors to implement an ASCII compression algorithm.

Table 5.
Entity Count by Level

Lvl	File Number 0001	0002	0003	0004	0005	0006	0007	Total
1	0	175	191	34	13	26	73	512
2	273	5	74	86	62	53	80	633
3	0	0	0	177	0	0	0	177
4	20	11	48	78	127	33	31	348
5	0	0	10	13	0	112	120	255
8	136	0	0	0	0	0	0	136
15	0	0	332	0	125	0	0	457
100	0	0	1	0	1	1	1	4
TOTAL	**429**	**191**	**656**	**388**	**328**	**225**	**305**	**2522**

It is recommended that sending systems be provided with AQC tools.

4 Summary of Recommendations

AQC Tools for Text Files

It is recommended that sending systems be provided with AQC tools and improved reference documentation to assist in preparing text in accordance with MIL-M-28001. The primary AQC tool would be a tag analyzer (lexical scanner and syntax parser).

IGES Improvements

It is recommended that the capability of IGES be expanded to include the parameterized definition of several fonts. Parameterized fonts would permit the exchange of illustrations with text callouts without requiring manual intervention at the receiving system to make the ASCII strings fit in the intended callout area on the illustration. A proposed solution has been presented in AITI Report 87-002.

5 Exhibits

Exhibits 1 through 12 follow this page. The table that follows numbers and describes the exhibits.

Table 6.
Exhibits

Publication Number, Abbreviated Title, and List of Exhibit Pages		
AITI-REF-1986-1	**AITI Validation Test Plan**	
Cover	Exhibit 1	As published
	Exhibit 2	As transmitted and processed
Text page	Exhibit 3	As published
	Exhibit 4	As transmitted and processed
Text page	Exhibit 5	As published
	Exhibit 6	As transmitted and processed
Text page	Exhibit 7	As published
	Exhibit 8	As transmitted and processed
Text page	Exhibit 9	As published
	Exhibit 10	As transmitted and processed
Illus.	Exhibit 11	As published
	Exhibit 12	As transmitted and processed

AITI-Ref-1986-1

Test Plan

VALIDATION TEST PLAN FOR MIL-STD-1840 (USAF) AUTOMATED INTERCHANGE OF TECHNICAL INFORMATION

SYSCON CORPORATION
LAWRENCE LIVERMORE NATIONAL LABORATORY
Subcontract 8914805

1986 OCTOBER 24
CHANGE 1 - 1986 December 15

Test Plan

VALIDATION TEST PLAN FOR MIL-STD-1840 (USAF) AUTOMATED INTERCHANGE OF TECHNICAL INFORMATION

SYSCON CORPORATION
LAWRENCE LIVERMORE NATIONAL LABORATORY
SUBCONTRACT 8914805

Distribution will be made by Lawrence Livermore National Laboratory

1986 OCTOBER 24
CHANGE 0 - CHANGE 1 - 1986 December 15

SECTION II

VALIDATION PRE-TEST ACTIVITY.

2-1. STATEMENT OF PRETEST ACTIVITY.

a. SGML-AF GenCode Tag Development. SGML-AF (Air Force implementation of SGML) has been in use and continued development for some time. Coding tags for many but not all types of documents have been developed. At this writing, Hill AFB and Warner Robins AFB are using the gencode tags developed to date for normal production. Figure 2-1 shows the development and implementation status for several document types.

Description	Status	Description	Status
MIL-M-38784A	In use	Work cards	In development
Operational Supplements	In use	MIL-M-38784B	Not contracted
Safety Supplements	In use	Checklists	In development
Time Compliance TOs	In use	Flight Manuals	Not contracted
TCTO Supplements	In use	Job Guides	Not contracted

GENSTAT6.DG

Figure 2-1. SGML-AF Development Status

b. IGES. IGES Version 3 was released in April, 1986. By design most IGES entities from earlier versions will be upward compatible with version 3. Part of the validation effort will be to determine if the IGES entities selected for Appendix A of the Standard vary from version 3 when generated by currently existing CAD vendor IGES processors.

IGES has had little more than token use as a formal delivery vehicle in industry, but that will change rapidly as the Standard is validated and contractual agreements begin to include the Standard.

c. CCITT group 4. CCITT group 4 has gained wide acceptance as a raster data exchange and storage format among industry leaders in electronic document capture and storage. The validation tests will make use of the ANAtech VANA raster to vector converter in the ATOS laboratory. ANAtech will be releasing (in time for the first test) an updated software package that converts data from a scanner to CCITT group 4 format. Additionally, that same software can receive CCITT group 4 and output the data in IGES format or in Auto-trol format. This will allow a 'sanity check' when dealing with CCITT group 4 data. This same software can also output the data in the triple-I v-bit format so that it can accompany text when output to the triple-I phototypesetter at any of the ATOS sites.

2-2. PRETEST ACTIVITY The test tools have been validated with the exception of the SGML Parser. This tool has been installed and is under test now.

b. IGES. IGES Version 3 was released in April, 1986. By design most IGES entities from earlier versions will be upward compatible with version 3. Part of the validation effort will be to determine if the IGES entities selected for Appendix A of the Standard vary from version 3 when generated by currently existing CAD vendor IGES processors.

IGES has had little more than token use as a formal delivery vehicle in industry, but that will change rapidly as the Standard is validated and contractual agreements begin to include the Standard.

c. CCITT group 4. CCITT group 4 has gained wide acceptance as a raster data exchange and storage format among industry leaders in electronic document capture and storage. The validation tests will make use of the ANAtech VANA raster to vector converter in the ATOS laboratory. ANAtech will be releasing (in time for the first test) an updated software package that converts data from a scanner to CCITT group 4 format. Additionally, that same software can receive CCITT group 4 and output the data in IGES format or in Auto-trol format. This will allow a 'sanity check' when dealing with CCITT group 4 data. This same software can also output the data in the triple-I v-bit format so that it can accompany text when output to the triple-I phototypesetter at any of the ATOS sites.

d. PRETEST ACTIVITY. The test tools have been validated with the exception of the SGML Parser. This tool has been installed and is under test now.

Figure 3-4 provides a software development schedule.

Figure 3-4. Software Development Schedule

c. Personnel. The testing crew will be staffed from personnel of the Advanced Technology Department of the San Diego Division of SYSCON.

d. Orientation Plan. No training will be required for tests at SYSCON.

e. Test Materials and Equipment.

(1) Deliverable Materials.

- Program listing and operator instructions on magnetic tape for DOCDEC verification software.
- Program listings and operator instructions on magnetic tape for miscellaneous control and utility software.
- Program listing and operator instructions on magnetic tape for for software to load AITI document into ATOS.
- Program listing and operator instructions on magnetic tape for for extracting a document from ATOS and building an AITI Standard magnetic tape.
- Benchmark database files on magnetic tape and listings
- Revised style and format files

(2) Site Supplied Materials. SYSCON will provide computer supplies, such as paper and magnetic tapes, and computer time and mass storage for data.

Figure 3-4 Software Development Schedule

c. Personnel. The testing crew will be staffed from personnel of the Advanced Technology Department of the San Diego Division of SYSCON.

d. Orientation Plan. No training will be required for tests at SYSCON.

e. Test Materials and Equipment.

(1) Deliverable Materials.

- Program listing and operator instructions on magnetic tape for DOCDEC verification software.
- Program listings and operator instructions on magnetic tape for miscellaneous control utility software.
- Program listing and operator instructions on magnetic tape for software to load AITI document into ATOS.
- Program listing and operator instructions on magnetic tape for extracting a document from ATOS and building an AITI Standard magnetic tape.
- Benchmark database files on magnetic tape and listings.
- Revised style and format files.

(2) Site Supplied Materials.\SYSCON will provide computer supplies, such as paper and magnetic tapes, and computer time and mass storage for data.

SECTION IV

TEST SPECIFICATION AND EVALUATION

4-1. TEST SPECIFICATION. This section presents four major topics: the test requirements, the test methodology, the progression of tests, and the evaluation of test results.

a. Requirements. The test requirements are allocated to four categories: magnetic tape media, the Document Declaration File, the Text files, the IGES files, and the CCITT group 4 files.

(1) Magnetic Tape Media Requirements. To be accepted, the magnetic tape must meet the following requirements.

1. The magnetic tape must be formatted in accordance with FIPS PUB 79 (reference 1).

2. The tape volume and file labels shall conform with level three or level four of FIPS PUB 79.

3. The data must be written on 9-track tape at a density of 1600 or 6250 bpi in accordance with FIPS PUBS 25, 50, 79 (references 2, 3, 1).

4. The tape volume identifier must consist of six characters. The first four characters shall identify the set and the last two character shall consist of the digits 0-9 and represent the number of the tape volume in the set.

5. The characters in the label must be limited to the ASCII uppercase letters and the digits 0-9.

6. The Document Declaration and Text files must be recorded with ANSI (reference 7) type D variable length records with block lengths of 2048 bytes.

7. The IGES (reference 8) files must be recorded with ANSI type F fixed length 80 byte records with block lengths of 2000 bytes.

8. The CCITT group 4 (reference 6) files must be recorded with the first block containing the the required header records in ANSI type F fixed length records with padding to 2048 bytes. The CCITT data must be written with 128 byte ANSI type F records in blocks of 2048 bytes.

9. The Document Declaration file(s) must precede all other types of files on the tape volume(s).

10. The data files must be grouped in the same order as the Document Declaration files. Files from different documents shall not be intermixed.

11. All records in the Document Declaration File and all header records specified for the text and illustration files are required.

(2) Document Declaration File Requirements. To be accepted, a Document Declaration file must meet the following requirements.

1. The filename and all records in the file must be ASCII characters.

2. The filename must contain exactly six characters.

3. The filename must be unique with respect to any other file name to be found in the set of files being transferred.

4. The first three characters of the filename must be 'DOC'.

5. The record type must be ANSI type D.

6. The record lengths must range from one byte to 256 bytes.

7. RECORD 1 - must contain an ASCII string agreed upon by the data source and the destination (SYSCON).

8. RECORD 2 - must contain an agreed upon ASCII string.

9. RECORD 3 - must contain an agreed upon ASCII string, or 'NONE'.

10. RECORD 4 - must contain an agreed upon ASCII string, or 'ORIGINAL'.

11. RECORD 5 - must contain an eight character string representing the date in the format YYYYMMDD, where 1970 ≤ YYYY ≤ 1987; 01 ≤ MM ≤ 12; 01 ≤ DD ≤ 31.

12. RECORD 6 - must contain an agreed upon ASCII string.

13. RECORD 7 - must contain an agreed upon ASCII string.

14. RECORD 8 - must contain an agreed upon ASCII string, or 'NONE'.

15. RECORD 9 - must contain an eight character string representing the date in the format YYYYMMDD, where 1986 ≤ YYYY ≤ 1987; 01 ≤ MM ≤ 12; 01 ≤ DD ≤ 31.

16. RECORD 10 - must contain an agreed upon ASCII string, or 'NONE'.

17. RECORD 11 - must contain one, two, three or four groups of ASCII digits. The groups must be separated with a comma. A space code following the comma is acceptable. The first group must

SECTION IV

TEST SPECIFICATION AND EVALUATION

4-1. TEST SPECIFICATION. This section presents four major topics: the test requirements, the test methodology, the progression of tests, and the evaluation of test results.

a. Requirements. The test requirements are allocated to four categories: magnetic tape media, the Document Declaration File, the Text files, the IGES files, and the CCITT group 4 files.

(1) Magnetic Tape Media Requirements.\To be accepted, the magnetic tape must meet the following requirements.

1. The magnetic tape must be formatted in accordance with FIPS PUB 79 (reference 1).

2. The tape volume and file labels shall conform with level three or level four of FIPS PUB 79.

3. The data must be written on 9-track tape at a density of 1600 or 6250 bpi in accordance with FIPS PUBS 25, 50, 79 (references 2, 3, 1).

4. The tape volume identifier must consist of six characters. The first four characters shall identify the set and the last two characters shall consist of the digits 0-9 and represent the number of the tape volume in the set.

5. The characters in the label must be limited to the ASCII uppercase letters and the digits 0-9.

6. The Document Declaration and Text files must be recorded with ANSI (reference 7) type D variable length records with block lengths of 2048 bytes.

7. The IGES (reference 8) files must be recorded with ANSI type F fixed length 80 byte records with block lengths of 2000 bytes.

8. The CCITT group 4 (reference 6) files must be recorded with the first block containing the required header records in ANSI type F fixed length records with padding to 2048 bytes. The CCITT data must be written with 128 byte ANSI type F records in blocks of 2048 bytes.

9. The Document Declaration file(s) must precede all other types of files on the tape volume(s).

10. The data files must be grouped in the same order as the Document Declaration files. Files from different documents shall not be intermixed.

11. All records in the Document Declaration File and all header records specified for the text and illustration files are required.

(2) Document Declaration File Requirements.\To be accepted, a Document Declaration file must meet the following requirements.

1. The filename and all records in the file must be ASCII characters.

2. The filename must contain exactly six characters.

3. The filename must be unique with respect to any other file name to be found in the set of files being transferred.

4. The first three characters of the filename must be 'DOC'.

5. The record type must be ANSI type D.

6. The record lengths must range from one byte to 256 bytes.

7. RECORD 1 - must contain an ASCII string agreed upon by the data source and the destination (SYSCON).

8. RECORD 2 - must contain an agreed upon ASCII string.

9. RECORD 3 - must contain an agreed upon ASCII string, or 'NONE'.

10. RECORD 4 - must contain an agreed upon ASCII string, or 'ORIGINAL'.

11. RECORD 5 - must contain an eight character string representing the date in the format YYYYMMDD, where 1970 ?? YYYY ?? 1987; 01 ?? MM ?? 12; 01 ?? DD ?? 31.

12. RECORD 6 - must contain an agreed upon ASCII string.

13. RECORD 7 - must contain an agreed upon ASCII string.

14. RECORD 8 - must contain an agreed upon ASCII string, or 'NONE'.

15. RECORD 9 - must contain an eight character string representing the date in the format YYYYMMDD, where 1986 ?? YYYY ?? 1987; 01 ?? MM ?? 12; 01 ?? DD ?? 31.

16. RECORD 10 - must contain an agreed upon ASCII string, or 'NONE'.

17. RECORD 11 - must contain one, two, three or four groups of ASCII digits. The groups must be separated with a comma. A space code following the comma is acceptable. The first group must

SECTION V

TEST DESCRIPTION

5-1. TEST DESCRIPTION.

a. Test Control. Tests are controlled by a script like procedure which is executed from the computer operators console. DEC Command Language command files are incorporated into the script by execution. A manual test log will also be maintained to record any observations or unexpected events.

Additional test control will be provided by occasional replication of the test to demonstrate reproducibility.

Figures 5-1 through 5-4 illustrate the flow of the test data through the various steps of the test. All tests will follow the same path. The only variations in the test will be in the data content.

The first step in each test will be to validate the Document Declaration File(s). (See Figure 5-1). If there is some difficulty detected then trouble shooting procedures will be applied. If the error is genuine (and therefore unrepairable) the test will be terminated. If the difficulty is due to operator error or other external cause, the test will be restarted.

When the Document Declaration files are acceptable, then the text, IGES and CCITT files will be validated. This is accomplished by counting the files and by examining the header records at the beginning of each of the files. If difficulties are encountered the same trouble shooting procedures as described for the Document Declaration File will be followed.

During the period of time described above, all of the software processes employed will generate process status messages and error detection messages. These messages will be stored on magnetic disk and included in the test report.

The test now enters a new phase where the individual data types of the document are examined. Each type of data (text tagged with SGML-AF, and illustrations in IGES or CCITT group 4 format) requires separate treatment. The procesing for text is shown in the lower part of Figure 5-1. In the future, the Datalogics gencode parser may be added to or substituted for the Datalogics Pager software that composes the text for display. This part of the diagram shows a consistent feature of all the tests: the comparison of some part of the data with the printed copy.

Figure 5-2 shows the processing of IGES data. The first step submits the IGES data to a Parser/Verifier from IGES Data Analysis. The software detects errors in the data and verifies the IGES version number with which the data is in compliance. Although not shown on the illustration, if there are any errors detected, they will be recorded and trouble shooting procedures applied as previously described. When the data successfully passes this examination, it will be converted from IGES format to Auto-trol format (S-5000). The data in S-5000 format will then be converted to triple-I UPF format (the same used by ATOS). This data will then be converted with SYSCON software for output on the Datalogics/QMS 1200 Laser printer. Again, the output will be compared with the paper document. If there are discrepancies, the trouble shooting procedures will be applied.

Figure 5-3 shows the processing of CCITT group 4 data. The first step is the conversion of the compressed raster format to a vector format that is native to the ANAtech workstation. Both visual examination and error detection by software are possible in this process. The vector formatted data is then passed to an ANAtech process which converts the data to a Standard Output Format. The SOF data is then processed by an Auto-trol program that converts it to Auto-trol S-5000 format. The illustration in its S-5000 form can then be viewed at the Auto-trol AGW workstation and compared with the paper document. If required, the illustration can be output on the Laser printer in the same way that the IGES data is output (not shown on the figure). If no trouble shooting is required, then the original CCITT data will be converted using ANAtech software to the triple-I v-bit format for output on a triple-I typesetter.

Figure 5-4 shows the final process where the whole document is assembled and typeset. The typesetter output (resin coated paper) is then compared with the printed version of the document. If the comparison is favorable (see section 4.4) then the data will be transferred from temporary storage to the benchmark data base.

SECTION V

TEST DESCRIPTION

5-1. TEST DESCRIPTION.

a. Test Control. Test are controlled by a script like procedure which is executed from the computer operators console. DEC Command Language command files are incorporated into the script by execution. A manual test log will also be maintained to records any observations or unexpected events.

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Figures 5-1 through 5-4 illustrate the flow of the test data through the various steps of the test. All tests will follow the same path. The only variations in the test will be in the data content.

The first step in each test will be to validate the Document Declaration File(s). (See Figure 5-1). If there is some difficulty detected then troubleshooting procedures will be applied. If the error is genuine (and therefore unrepairable) the test will be terminated. If the difficulty is due to operator error or other external cause, the test will be restarted.

When the Document Declaration Files are acceptable, then the text, IGES and CCITT files will be validated. This is accomplished by counting the files and by examining the header records at the beginning of each of the files. If difficulties are encountered the same troubleshooting procedures as described for the Document Declaration File will be followed.

During the period of time described above, all of the software processes employed will generate process status messages and error detection messages. These messages will be stored on magnetic disk and included in the test report.

The test now enters a new phase where the individual data types of the document are examined. Each type of data (text tagged with SGML-AF, and illustrations in IGES or CCITT group 4 format) requires separate treatment. The processing for text is shown in the lower part of Figure 5-1. In the future, the Datalogics gencode parser may be added to or substituted for the Datalogics Pager software that composes the text for display. This part of the diagram shows a consistent feature of all the tests: the comparison of some part of the data with the printed copy.

Figure 5-2 shows the processing of IGES data. The first step submits the IGES data to a Parser/Verifier from IGES Data Analysis. The software detects errors in the data and verifies the IGES version number with which the data is in compliance. Although not shown on the illustration, if there are any errors detected, they will be recorded and troubleshooting procedures applied as previously described. When the data successfully passes this examination, it will be converted from IGES format to Auto-Trol format (S-5000). The data in S-5000 format will then be converted to triple-I UPF format (the same used by ATOS). This data will then be converted with SYSCON software for output on the Datalogics/QMS 1200 Laser printer. Again, the output will be compared with the paper document. If there are discrepancies, the troubleshooting procedure will be applied. Figure 5-3 shows the processing of CCITT group 4 data. The first step is the conversion of the compressed raster format to a vector format that is native to the ANAtech workstation. Both visual examination and error detection by software are possible in this process. The vector formatted data is then passed to an ANAtech process which converts the data to a Standard Output Format. The SOF data is then processed by an Auto-trol program that converts it to Auto-trol S-5000 format. The illustration in its S-5000 form can then be viewed at the Auto-trol AGW workstation and compared with the paper document. If required, the illustration can be output on the Laser printer in the same way that the IGES data is output (not shown on the figure). If no trouble-shooting is required, then the original CCITT data will be converted using ANAtech software to the triple-I v-bit format for output on a triple-I typesetter. Figure 5-4 shows the final process where the whole document is assembled and typeset. The typesetter output (resin coated paper) is then compared with the printed version of the document. If the comparison is favorable (see section 4.4) then the data will be transferred from temporary storage to the benchmark data base.

AITI-Ref-1986-1

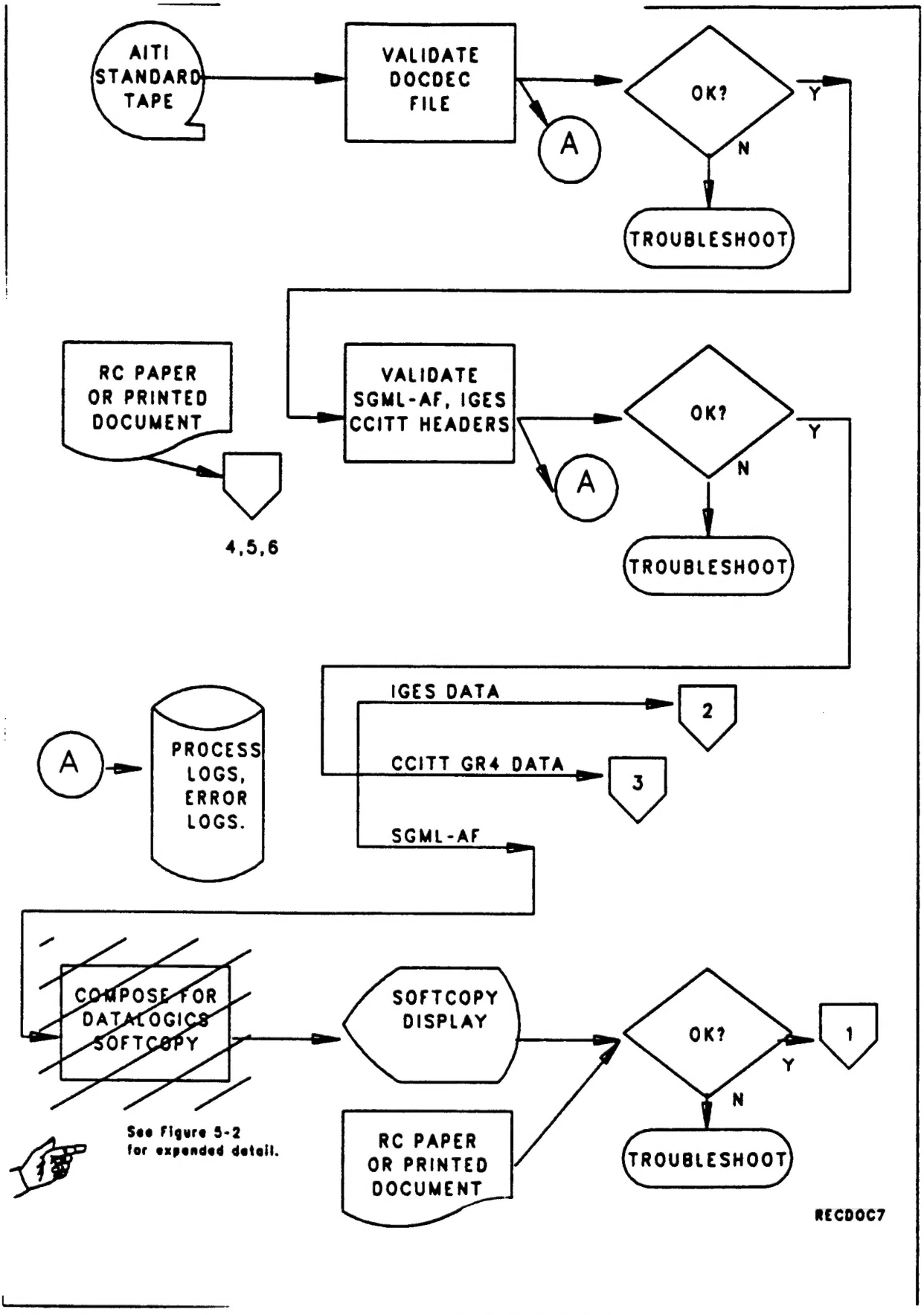

Figure 5-1. Preliminary Validation

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Exhibit 12 - As transmitted and processed